

Supplemental Table 3. Effect of smoked cannabis on neurocognitive function: laboratory studies

Task	THC Dose	N	Age (years) Mean±SD, [Range]	Cannabis History	Measure	Time (h) After THC Dosing	Outcome	Relative to	Ref.
<i>Memory</i>									
Free recall	Two 3.6% THC joints; 4 puffs/joint spaced by 2 h	14	24.5, [21-34]	≥1x/Month; 10/14: >100 lifetime occasions	# Words recalled	~1.25-1.5 <sup>b</sup>	ns	Placebo	(56)
<i>Distance/Time Perception</i>									
Estimated time & distance to approaching car	13, 17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	Distance estimation	~1.25 <sup>a</sup>	ns	Placebo	(62)
Estimated time & distance to approaching car	13, 17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	Time estimation	~1.25 <sup>a</sup>	ns	Placebo	(62)
Time production	Two 3.6% THC joints (4 puffs/joint) spaced by 2 h	14	24.5, [21-34]	≥1x/Month; 10/14: >100 lifetime occasions	Respond when believe 30, 60, 120 sec elapsed	~1.25 <sup>b</sup>	Underproduction (estimated time intervals shorter than targets)	Placebo	(56)
<i>Logical/Mathematical Reasoning Skills</i>									
WCS	13 mg	14	27±7.45	≥1 Joint/day for ≥5 years	# Blocks completed without error	~0.75 <sup>a</sup>	-1.2 (16.6 vs. 17.8)	Placebo	(62)
WCS	17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	# Blocks completed without error	~0.75 <sup>a</sup>	-1.6 (16.2 vs. 17.8)	Placebo	(62)
WCS	13 mg	14	27±7.45	≥1 Joint/day for ≥5 years	# Non- perseverance errors	~0.75 <sup>a</sup>	+1.1 (4.3 vs. 3.2)	Placebo	(62)

Task	THC Dose	N	Age (years) Mean±SD, [Range]	Cannabis History	Measure	Time (h) After THC Dosing	Outcome	Relative to	Ref.
WCS	17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	# Non- perseverance errors	~0.75 <sup>a</sup>	+2.1 (5.3 vs. 3.2)	Placebo	(62)
WCS	13 mg	14	27±7.45	≥1 Joint/day for ≥5 years	# Total errors	~0.75 <sup>a</sup>	+1.2 (5.0 vs. 3.8)	Placebo	(62)
WCS	17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	# Total errors	~0.75 <sup>a</sup>	+1.9 (5.7 vs. 3.8)	Placebo	(62)
DSST	Two 3.6% THC joints; 4 puffs/joint spaced by 2 h	14	24.5, [21-34]	≥1x/Month; 10/14: >100 lifetime occasions	Percentage correct	~1.25-1.5 <sup>b</sup>	-4.8% (91.3 vs. 96.1%)	Before drug dose	(56)
Backward digit span	Two 3.6% THC joints; 4 puffs/joint spaced by 2 h	14	24.5, [21-34]	≥1x/Month; 10/14: >100 lifetime occasions	--	~1.25-1.5 <sup>b</sup>	ns	Before drug dose	(56)
Logical reasoning	Two 3.6% THC joints; 4 puffs/joint spaced by 2 h	14	24.5, [21-34]	≥1x/Month; 10/14: >100 lifetime occasions	True/False statements about letter pairs	~1.25-1.5 <sup>b</sup>	ns	Before drug dose	(56)
<i>Decision-Making</i>									
Gambling	13, 17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	Decision making speed	~1.0 <sup>a</sup>	ns	Placebo	(62)
Gambling	13 mg	14	27±7.45	≥1 Joint/day for ≥5 years	Percentage choices of less likely outcomes	~1.0 <sup>a</sup>	ns	Placebo	(62)
Gambling	17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	Percentage choices of less likely outcomes	~1.0 <sup>a</sup>	significantly higher	Placebo	(62)
Tower of London	250 µg/kg (~17.5 mg)	20	19-29	≥5x in past year	# Correct decisions	0.75	-2.1±1.1	Placebo	(41)

Task	THC Dose	N	Age (years) Mean±SD, [Range]	Cannabis History	Measure	Time (h) After THC Dosing	Outcome	Relative to	Ref.
Tower of London	250 µg/kg (~17.5 mg)	20	19-29	≥5x in past year	# Correct decisions	1.75	-2.2±1.1	Placebo	(41)
Tower of London	250 µg/kg (~17.5 mg)	20	19-29	≥5x in past year	# Correct decisions	5.75	+0.3±0.8	Placebo	(41)
Tower of London	500 µg/kg (~35 mg)	20	19-29	≥5x in past year	# Correct decisions	0.75	-2.6±0.59	Placebo	(41)
Tower of London	500 µg/kg (~35 mg)	20	19-29	≥5x in past year	# Correct decisions	1.75	-3.2±1.0	Placebo	(41)
Tower of London	500 µg/kg (~35 mg)	20	19-29	≥5x in past year	# Correct decisions	5.75	-1.0±0.9	Placebo	(41)
Tower of London	500 µg/kg (~35 mg)	12	22.8±2.3	≤1Day/week, 55±36 occasions/year, 1.2±0.5 joints/occasion	# Correct decisions	1.0	ns	Placebo	(5)
Tower of London	500 µg/kg (~35 mg)	12	22.8±2.3	≤1Day/week, 55±36 occasions/year, 1.2±0.5 joints/occasion	RT	1.0	ns	Placebo	(5)
Tower of London	500 µg/kg (~35 mg)	12	23.2±3.3	>4 Days/week in past year, 340±86 occasions/year, 2.3±1.2 joints/occasion	# Correct decisions	1.0	ns	Placebo	(5)
Tower of London	500 µg/kg (~35 mg)	12	23.2±3.3	>4 Days/week in past year, 340±86 occasions/year, 2.3±1.2 joints/occasion	RT	1.0	ns	Placebo	(5)

Task	THC Dose	N	Age (years) Mean±SD, [Range]	Cannabis History	Measure	Time (h) After THC Dosing	Outcome	Relative to	Ref.
Tower of London	400 µg/kg (~28 mg)	21	23.2±8.4 [19-38]	>4 Days/week in past year, 373.7±101.6 occasions/year, 5.0±3.9 joints/occasion	# Correct decisions	1.17-3.17	ns	Before THC dose	(63)
Tower of London	400 µg/kg (~28 mg)	21	23.2±8.4 [19-38]	>4 Days/week in past year, 373.7±101.6 occasions/year, 5.0±3.9 joints/occasion	RT	1.17-3.17	ns	Before THC dose	(63)
<i>Integrated</i>									
Virtual Maze	13, 17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	Completion time	Immediately after vitals	ns	Placebo	(62)
Virtual Maze	13 mg	14	27±7.45	≥1 Joint/day for ≥5 years	Mean # wall collisions per trial	Immediately after vitals	ns	Placebo	(62)
Virtual Maze	17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	Mean # wall collisions per trial	Immediately after vitals	+2.6 (5.5 vs. 2.9)	Placebo	(62)
Virtual Maze	17 mg	14	27±7.45	≥1 Joint/day for ≥5 years	Mean # wall collisions per trial	Immediately after vitals	+2.3 (5.5 vs. 3.2)	13 mg THC	(62)
CTT	250 µg/kg (~17.5 mg)	20	19-29	≥5x in past year	$\lambda c^c$	0.25	-0.21±0.13 rad/sec	Placebo	(41)
CTT	250 µg/kg (~17.5 mg)	20	19-29	≥5x in past year	$\lambda c$	1.25	-0.40±0.16 rad/sec	Placebo	(41)
CTT	250 µg/kg (~17.5 mg)	20	19-29	≥5x in past year	$\lambda c$	3.25	-0.18±0.13 rad/sec	Placebo	(41)
CTT	250 µg/kg (~17.5 mg)	20	19-29	≥5x in past year	$\lambda c$	5.25	-0.17±0.13 rad/sec	Placebo	(41)

Task	THC Dose	N	Age (years) Mean±SD, [Range]	Cannabis History	Measure	Time (h) After THC Dosing	Outcome	Relative to	Ref.
CTT	500 µg/kg (~35 mg)	20	19-29	≥5x in past year	λc	0.25	-0.60±0.21 rad/sec	Placebo	(41)
CTT	500 µg/kg (~35 mg)	20	19-29	≥5x in past year	λc	1.25	-0.55±0.17 rad/sec	Placebo	(41)
CTT	500 µg/kg (~35 mg)	20	19-29	≥5x in past year	λc	3.25	-0.27±0.13 rad/sec	Placebo	(41)
CTT	500 µg/kg (~35 mg)	20	19-29	≥5x in past year	λc	5.25	-0.48±0.08 rad/sec	Placebo	(41)
CTT	500 µg/kg (~35 mg)	12	22.8±2.3	≤1Day/week, 55±36 occasions/year, 1.2±0.5 joints/occasion	λc	0.17	~ -0.7 rad/sec	Placebo	(5)
CTT	500 µg/kg (~35 mg)	11	22.8±2.3	≤1Day/week, 55±36 occasions/year, 1.2±0.5 joints/occasion	λc	3.08	~ -0.6 rad/sec	Placebo	(5)
CTT	500 µg/kg (~35 mg)	11	22.8±2.3	≤1Day/week, 55±36 occasions/year, 1.2±0.5 joints/occasion	λc	5.08	~ -0.2 rad/sec	Placebo	(5)
CTT	500 µg/kg (~35 mg)	11	22.8±2.3	≤1Day/week, 55±36 occasions/year, 1.2±0.5 joints/occasion	λc	7.08	~ -0.4 rad/sec	Placebo	(5)

Task	THC Dose	N	Age (years) Mean±SD, [Range]	Cannabis History	Measure	Time (h) After THC Dosing	Outcome	Relative to	Ref.
CTT	500 µg/kg (~35 mg)	12	23.2±3.3	>4 Days/week in past year, 340±86 occasions/year, 2.3±1.2 joints/occasion	--	0.17-7.08	ns	Placebo	(5)
CTT	400 µg/kg (~28 mg)	21	23.2±8.4 [19-38]	>4 Days/week in past year, 373.7±101.6 occasions/year, 5.0±3.9 joints/occasion	λc	0.3-3.3	ns	Before THC dose	(63)
DAT	2 0% or 3.6% THC joints (4 puffs/joint) spaced by 2 h	14	24.5, [21-34]	≥1x/Month; 10/14: >100 lifetime occasions	Response to primary target: hit rate	~1.25-1.5 <sup>b</sup>	ns	Before drug dose	(56)
DAT	2 0% or 3.6% THC joints (4 puffs/joint) spaced by 2 h	14	24.5, [21-34]	≥1x/Month; 10/14: >100 lifetime occasions	Response to primary target: RT	~1.25-1.5 <sup>b</sup>	ns	Before drug dose	(56)
DAT	2 0% or 3.6% THC joints (4 puffs/joint) spaced by 2 h	14	24.5, [21-34]	≥1x/Month; 10/14: >100 lifetime occasions	# False alarm responses	~1.25-1.5 <sup>b</sup>	+0.7 (1.6 vs. 0.9)	Before drug dose	(56)
DAT	500 µg/kg (~35 mg)	12	22.8±2.3	≤1Day/week, 55±36 occasions/year, 1.2±0.5 joints/occasion	Tracking error	0.33	~ +5.0 mm	Placebo	(5)

Task	THC Dose	N	Age (years) Mean±SD, [Range]	Cannabis History	Measure	Time (h) After THC Dosing	Outcome	Relative to	Ref.
DAT	500 µg/kg (~35 mg)	12	22.8±2.3	≤1Day/week, 55±36 occasions/year, 1.2±0.5 joints/occasion	% Correct detections on secondary task	0.33	~ -10%	Placebo	(5)
DAT	500 µg/kg (~35 mg)	12	22.8±2.3	≤1Day/week 55±36 occasions/year, 1.2±0.5 joints/occasion	# Control losses	0.33	~ +39	Placebo	(5)
DAT	500 µg/kg (~35 mg)	12	23.2±3.3	>4 Days/week in past year, 340±86 occasions/year, 2.3±1.2 joints/occasion	Tracking error	0.33	ns	Placebo	(5)
DAT	500 µg/kg (~35 mg)	12	23.2±3.3	>4 Days/week in past year, 340±86 occasions/year, 2.3±1.2 joints/occasion	% Correct detections on secondary task	0.33	ns	Placebo	(5)
DAT	500 µg/kg (~35 mg)	12	23.2±3.3	>4 Days/week in past year, 340±86 occasions/year, 2.3±1.2 joints/occasion	# Control losses	0.33	ns	Placebo	(5)

Task	THC Dose	N	Age (years) Mean±SD, [Range]	Cannabis History	Measure	Time (h) After THC Dosing	Outcome	Relative to	Ref.
DAT	400 µg/kg (~28 mg)	21	23.2±8.4 [19-38]	>4 Days/week in past year, 373.7±101.6 occasions/year, 5.0±3.9 joints/occasion	# Control losses	0.5-2.5	Increased	Before THC dose	(63)
DAT	400 µg/kg (~28 mg)	21	23.2±8.4 [19-38]	>4 Days/week in past year, 373.7±101.6 occasions/year, 5.0±3.9 joints/occasion	# Correct detections on secondary task	0.5-2.5	Decreased	Before THC dose	(63)
DAT	400 µg/kg (~28 mg)	21	23.2±8.4 [19-38]	>4 Days/week in past year, 373.7±101.6 occasions/year, 5.0±3.9 joints/occasion	RT	0.5-2.5	Increased	Before THC dose	(63)
<i>Reaction Time/Motor Impulsivity</i>									
SST	250 µg/kg (~17.5 mg)	11	19-29	≥5x in past year	Stop RT	0.5	+17.5±17.2 msec	Placebo	(41)
SST	250 µg/kg (~17.5 mg)	11	19-29	≥5x in past year	Stop RT	1.5	+10.9±22.9 msec	Placebo	(41)
SST	250 µg/kg (~17.5 mg)	11	19-29	≥5x in past year	Stop RT	3.5	-3.3±20.1 msec	Placebo	(41)
SST	250 µg/kg (~17.5 mg)	11	19-29	≥5x in past year	Stop RT	5.5	+4.8±11.4 msec	Placebo	(41)
SST	500 µg/kg (~35 mg)	11	19-29	≥5x in past year	Stop RT	0.5	+60.6±21.6 msec	Placebo	(41)
SST	500 µg/kg (~35 mg)	11	19-29	≥5x in past year	Stop RT	1.5	+64.6±25.0 msec	Placebo	(41)
SST	500 µg/kg (~35 mg)	11	19-29	≥5x in past year	Stop RT	3.5	+12.9±12.0 msec	Placebo	(41)



Task	THC Dose	N	Age (years) Mean±SD, [Range]	Cannabis History	Measure	Time (h) After THC Dosing	Outcome	Relative to	Ref.
SST	500 µg/kg (~35 mg)	11	19-29	≥5x in past year	Stop RT	5.5	+7.0±17.9 msec	Placebo	(41)
SST	500 µg/kg (~35 mg)	12	22.8±2.3	≤1Day/week, 55±36 occasions/year, 1.2±0.5 joints/occasion	Stop RT	0.58	~ +25 msec	Placebo	(5)
SST	500 µg/kg (~35 mg)	12	23.2±3.3	>4 Days/week in past year, 340±86 occasions/year, 2.3±1.2 joints/occasion	Stop RT	0.58	~ +110 msec	Placebo	(5)
SST	400 µg/kg (~28 mg)	21	23.2±8.4 [19-38]	>4 Days/week in past year, 373.7±101.6 occasions/year, 5.0±3.9 joints/occasion	Stop RT	1-3	ns	Before THC dose	(63)
SST	400 µg/kg (~28 mg)	21	23.2±8.4 [19-38]	>4 Days/week in past year, 373.7±101.6 occasions/year, 5.0±3.9 joints/occasion	Commission errors	1-3	ns	Before THC dose	(63)

<sup>a</sup>Denotes times after smoking initiated

<sup>b</sup>Denotes times after smoking completed

<sup>c</sup>λc: Critical frequency (tracking frequency at which control loss occurs)

Abbreviations: THC: Δ<sup>9</sup>-tetrahydrocannabinol; SD: standard deviation; ns: not significant; WCS: Wisconsin Card Sorting; DSST: Digit Symbol Substitution Test; RT: reaction time; CTT: critical tracking task; DAT: divided attention task; SST: stop signal task